

AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Sensor Description

Manufacturer/Model:
Aeroqual
Model AQY v0.5

Pollutants:
Ozone

Measurement Range:
0 - 200 ppb

Type: Gas Sensitive
Semiconductor (GSS)



Additional Information

Field evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/field>

Lab evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/laboratory>

AQ-SPEC website:

<http://www.aqmd.gov/aq-spec>

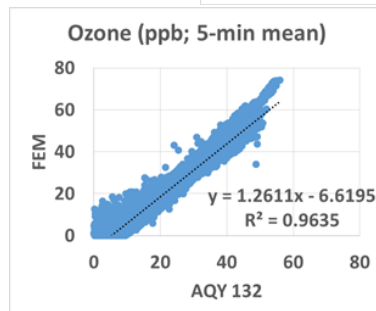
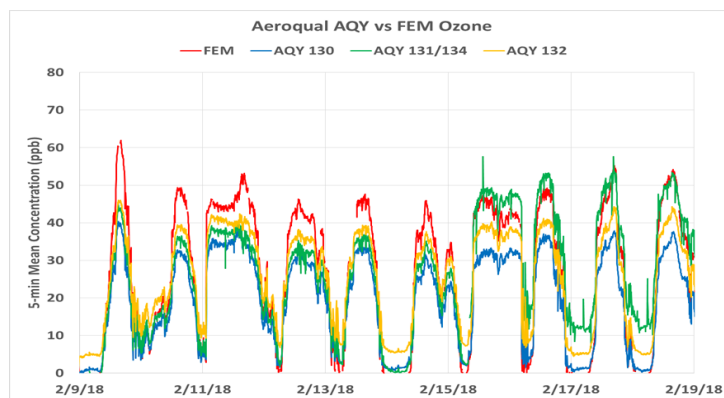
Evaluation Summary

- Overall, the three Aeroqual AQY sensors showed decreased accuracy with increasing ozone concentration; with accuracy ranging from 11.4% at the highest ozone concentration to 79% at the lowest ozone concentration. They underestimated the FEM ozone measurements for a concentration range between 0 to 400 ppb
- The three Aeroqual AQY sensors exhibited high precision for most of the tested T/RH combinations in the environmental chamber.
- Aeroqual AQY sensors showed low intra-model variability in the field deployment and low to moderate intra-model variability in the laboratory testing.
- Aeroqual AQY sensors had good data recovery (76-100 % for 5-min average in the field, and 100% for 1-min average in the laboratory).
- For ozone, the Aeroqual AQY sensors showed high correlation with the reference instrument from both the field ($R^2 \sim 0.96$) and laboratory studies ($R^2 > 0.97$).

Field Evaluation Highlights

- Deployment period 12/22/2017- 03/27/2018: the Aeroqual AQY sensors (units IDs: 130, 131, 132, 134) correlated well with ozone concentration changes as monitored by the FEM instrument.
- The units showed > 92% data recovery as well as low intra-model variability.

$R^2 \sim 0.96$



Coefficient of Determination (R^2) quantifies how the three sensors followed the ozone concentration change measured by the FEM instrument.

An R^2 approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Laboratory Evaluation Highlights

Accuracy

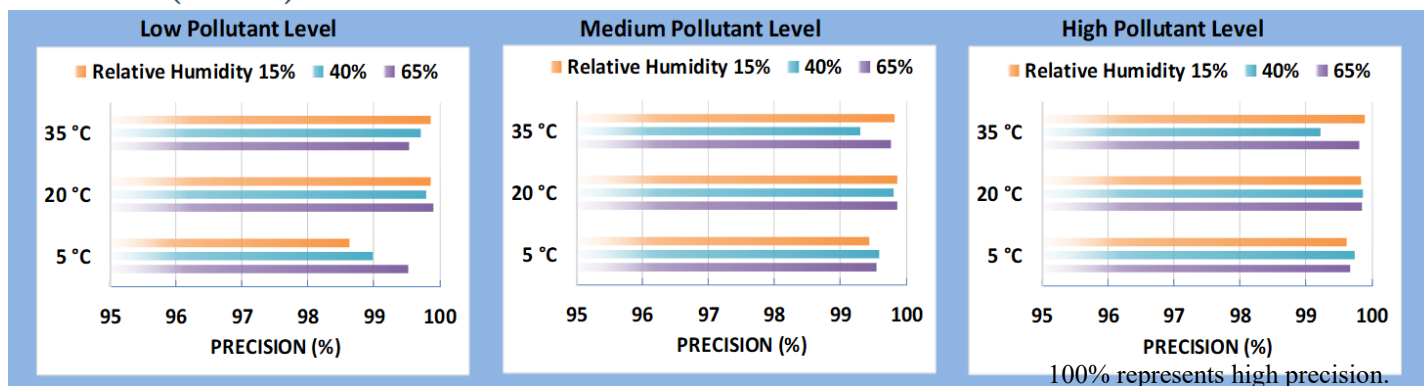
$$A (\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$$

Steady State (#)	Sensor mean (ppb)	FEM (ppb)	Accuracy (%)
1	15.4	19.5	79.0
2	17.9	42.9	41.7
3	20.8	68.8	30.2
4	30.0	178.8	16.8
5	42.0	368.3	11.4

Accuracy was evaluated by a concentration ramping experiment at 20 °C and 40%. The sensor's readings at each ramping steady state are compared to the reference instrument. A negative % means that sensors overestimate reference instrument's reading by 2 folds.

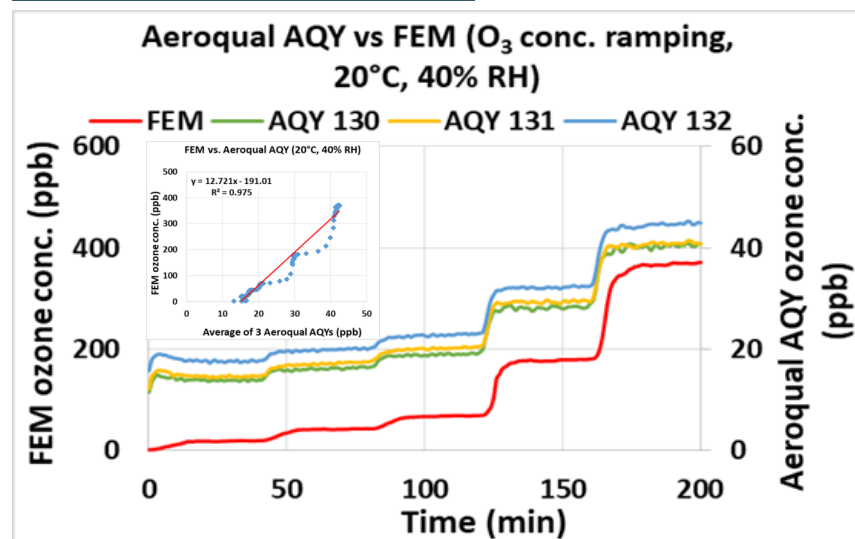


Precision (Ozone)



Sensor's ability of generating precise measurements of ozone concentration at low, medium, and high pollutant levels were evaluated under 9 combinations of T and RH, including extreme weather conditions like cold and dry (5 °C and 15%), cold and humid (5 °C and 65%), hot and humid (35 °C and 65%), or hot and dry (35 °C and 15%).

Coefficient of Determination



The three Aeroqual AQY sensors showed good correlation with the corresponding FEM data ($R^2 > 0.97$) at 20 °C and 40% RH.

Climate Susceptibility (Coefficient of Determination R^2)

R^2	5 °C	20 °C	35 °C
15%	0.966	0.966	0.967
40%	0.969	0.975	0.967
65%	0.970	0.961	0.961

Observed Interferents

N/A



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